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Configuration Management Supporting Process

The purpose of configuration management (CM) is to ensure all work products received or generated by the project are adequately documented, stored and managed. The intent being that any prior version of an item could be retrieved and/or re-created, if necessary. Both the project office and the Contractor should have **Configuration Management Plans** (CMP) to describe their approach to CM, and an automated tool (for both **software CM** and **document CM**) to assist with tracking.

For projects performing oversight of a contractor, the project office CMP should focus on control of the system requirements, received and generated documents, project tools, and the project network. If the project is performing co-development with the Contractor, the CMP should clearly define what the project office is controlling and what the Contractor is controlling (for example, the supplier may control the software and hardware, but the project may control the interfaces and data).

There are four basic elements to configuration management:

- **Configuration Identification** - Identifying and documenting the functional and physical characteristics of controlled items
- **Configuration Storage** - Identifying the mechanisms to be used to store controlled items.
- **Change Control** - Authorizing changes to controlled items and their related documentation
- **Configuration Status Reporting** - Recording and reporting information needed to manage controlled items effectively, including the status of proposed changes and approved changes
- **Configuration Reviews** - Verifying conformance to specifications, drawings, interface control documents, and other contract requirements

References:
- **IEEE 828-1998** (link to pdf), Standard for Software Configuration Management Plans
- **IEEE 1042-1987** (link to pdf), Guide to Software Configuration Management (note this standard has been withdrawn, but is referenced for background information)
- Software Program Managers Network (SPMN), **Little Book of Configuration Management** (pdf)

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The purpose of M&O is to continue operational support of the system in production, including periodic maintenance, fixes and changes, until the system is replaced or retired.

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Maintenance and Operations (M&O) Strategy

M&O Main

The M&O strategy defines the general approach for maintenance and operations activities. The intent of the M&O Strategy is to identify the assumptions and establish the framework for the M&O section of the Request for Proposal. The Strategy should identify the activities that you expect the Contractors to address in their proposals and to re-affirm within the organization the strategy to be used for M&O activities once the project is completed.

The strategy should define how the project office expects to divide M&O responsibilities between the State and Contractor(s). Once the Contract is awarded, the Contractor and/or State will develop a detailed **M&O Plan** that must be consistent with this strategy. Typical M&O issues include:

M&O Responsibilities. Who is responsible for performing what activities? Consider the following organizations: project staff, HHSDC operations staff, prime contractor, subcontractor, county staff, sponsor staff, outsourced consultants.

Transition Activities. Once the system is put into production, who has the primary responsibility for the system? Is the prime contractor initially responsible as part of the acquisition contract? If not, how will the transition of responsibilities be performed?

Training. If the prime contractor is not responsible for the M&O activities, has sufficient time and training been provided for each of the staff and staffing levels? What are the State and Contractor's roles for training on the new system? What are the user classes? How many people will need training in each class? What type of training will they need? Is on-the-job training and mentoring included to allow hands-on learning?

Knowledge Transfer. If the prime contractor is not responsible for the M&O activities, have sufficient time and opportunities been provided for each of the staff and staffing levels to learn from the contractor? A period of 6-12 months is generally recommended so that staff may experience a complete year's processing including peaks/valleys and end of the year processing activities.

Change Control. How will changes to the system be handled? What is the process and how are each of the participants involved? Who is responsible for analysis and approvals?

Day-to-Day Operations. How will day-to-day operations be handled and by whom? What is the process and who is responsible for resolution of any problems?

Maintenance. How will maintenance activities be handled and by whom? What is the process and who is responsible for scheduling and notifications of the work?

Help Desk Procedures. Will Contractor and/or State staff maintain the help desk? Are third-party vendors also involved? When must help desk services be available? What is the expected response time? If there are multiple help desks (for instance, county and state help desks), what is the escalation process and problem closure process?

Sample:

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Configuration Management - Identification of Items   **CM Main**

The process of configuration identification involves identifying those items that should be controlled, ensuring all controlled items (CIs) are uniquely named and/or numbered (by inventory number or version), documenting the functional characteristics (what is its purpose or use), and documenting the physical characteristics of the item. Controlled items may be paper or electronic media, hardware or networks; provisions must be made to store and control all items regardless of the media.

The table below identifies various types of CIs and how CIs increase as the project progresses. Initially, the project owner/sponsor controls and tracks such things as legislation, regulations and program policies. When the Project Office is formed, they generate more CIs, such as project computers and infrastructure, project charter, contracts, funding documents (APDs, BCPs), risk management plans, requirements management plans/tools, and configuration management and change control plans/tools. As the project progresses, the contractor begins to create the deliverables specified by the contract such as custom software, requirements and design documents, and test tools. Initially the contractor is responsible for tracking changes against the deliverables. After the item has been accepted by the State, change control for the deliverable must be coordinated between the State and the contractor.

Types Of Configuration Items

Legislation/Owner	**Project Office**	**End Item**
Documentation	Documentation	Documentation
	Hardware	Hardware
	Tools	Tools
		Software

Examples of controlled items for the project office are listed below.

A. Project Office documents to include:

  1. Request for Proposal
  2. Contract(s)
  3. Statement of Work(s)
  4. System Requirements Specification
  5. Form Definitions
  6. Report Definitions
  7. External Interface Guidance Document(s)
  8. Project Charter
  9. Project Approval Documents
      a) Advance Planning Documents
      b) Budget Change Proposals
      c) Feasibility Study Reports

  10. Project Plans and Processes (see also **project process list**)

      a) Proposal Evaluation Plan
      b) Project Master Plan
      c) Configuration Management Plan
      d) Quality Assurance Plan
      e) Test and Evaluation Plan
       f) Governance Plan
  11. Inter-agency agreements

B. Project office equipment to include (see also **project infrastructure list**):

  1. Project Workstation/Server Equipment
  2. Development or Test Environments (if controlled by the project)
  3. Project Tools (such as issue tracking or requirement tracking systems)

      4. Generated and Received Correspondence/Faxes
      5. Project Web Site/Intranet
      6. Commercial Software, Documentation, and Licenses

C. Specific examples of controlled items for the Contractor typically include:
    1. System Source Code
    2. System Hardware
    3. Drawings
    4. Support & Test Hardware
    5. Test & Analysis Tools
    6. Key Data or Environmental Files
    7. Product Documentation to include:
        a) Master Project Plan
        b) System Architectural Design
        c) System/Subsystem Design Document
        d) Software Requirements Specification (SRS)
        e) Software Design Document (SDD)
        f) Software Development Plan (SDP)
        g) Software Test Plan (STP)
        h) Software Test Description (STD)
        i) Software Test Report (STR)
        j) Interface Requirements Specification (IRS)
        k) Interface Design Document (IDD)
        l) Version Description Document/Software Version Description (VDD/SVD)
        m) Software Development Folders (SDF)
        n) Configuration Management Plan (CMP)
        o) Technical Manuals
        p) Hardware Test Plans and Test Procedures
        q) Interface Control Drawing (ICDs)
        r) Software Problem/Change Requests (P/CRs)
        s) Database Design Description (DBDD)
        t) Software User Documentation

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Configuration Management - Storage

CM Main

All controlled items should be placed in a CM library for control and maintenance. A Librarian is needed to oversee and manage the contents of the library. This library may be separate from the project reference library to ensure greater control of items. In general, the configuration management library will:

- Provide secure storage for work products and controlled items
- Provide controlled access to the work products and controlled items
- Provide for the secure storage and recovery of archive versions of work products and controlled items
- Provide storage, update, and retrieval of configuration management records
- Support the correct creation of new products or versions from the baseline
- Support the production of configuration management reports
- Provide for maintenance (e.g. backup, restoring of library files, and recovery from library errors) of the library structure and contents

Sufficient storage must be available to handle the anticipated volume of data/items during the entire product life cycle. Library storage and tracking requirements are fulfilled through the use of manual and automated tools. The choice of tools (e.g., **software CM tools**, **document management tools**), whether manual or automated, is dictated by project need.

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Configuration Management - Change Control

CM Main

Change Control Overview

Controlling changes to the identified items is an important part of CM. The purpose is to ensure that the impacts and rationale for each change are analyzed and coordinated prior to being authorized. Changes, in this context, refer to changing the functionality of an item or adding additional functionality (i.e.: changes to the project scope).

The level of formality in the change control process varies from item to item. For documents, a simple check-in/out and document review process is generally sufficient. For hardware, software, and requirements, a more formal analysis and approval process is required due to the complexity of the item and the extent of possible impacts. For these items, a change control board is often used to review impacts and grant approvals.

Change Control Board (CCB)

The CCB should be comprised of members from project management, the system architect, quality assurance, implementation, and systems engineering, as well as the program/business area and the Contractor. Additional representatives may be added as needed (such as from the Financial or IT areas).

Depending on the project approach (oversight vs. co-development), the change control approach may differ. In the oversight approach, the project may have a CCB that is used to filter and/or prioritize changes prior to involving the Contractor. This may consist of reviewing requests from the user, program/business office, or the control agencies to ensure the required information is complete, the necessary funds are available (if costs are known), to ensure all affected parties have been identified (for inclusion in the analysis process), and to determine the merit/benefit of the proposed change. In this scenario, approved changes would then be forwarded to the Contractor's Change Request/Control Process to be analyzed for system impacts and cost. The Contractor would respond with a time and cost estimate and the project management would approve and prioritize the desired changes.

In the co-development approach, the Change Control Process takes the more classical approach with the State and the Contractor working together to perform the analysis, and determine the approval and prioritization of each request.

Changes to external interfaces are handled differently depending who owns the interface. For new interfaces with external entities, an Interface Control Working Group (ICWG) should be formed to jointly control updates and changes to the interface. For established interfaces which the new system is connecting to, the project must follow the process defined by the interface's owner.

It is imperative in all cases, that the governance of the CCB and/or ICWG is clearly defined to avoid deadlocks regarding approval. Styles of governance differ depending on the management approach. Approvals may be based on a single-decision maker (such as the Project Manager), voting members, or recommendations to a management authority (Project Manager or Sponsor).

Samples and Supporting Materials

- **CWS/CMS Move/Add/Change (MAC) Plan** (MS Word)

- **CalWIN Software Correction Management Process** (pdf)

- **EBT Change Request Form** (MS Word)

- **EBT Change Control Board (CCB) Minutes** (MS Word)

- **EBT Work Plan Change Request Form** (MS Word)

- SFIS Change Acceptance and Validation Procedures for M&O (MS Word)

- **Federal example of an ICWG Process**

Wednesday, November 19, 2003

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The following sample was taken from the federal CHCS II project and depicts a sample Interface Control Working Group agenda.

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Configuration Management - Sample ICWG Process

CM Main

Title: Interface Control Working Group (ICWG) Coordination and Conduct

Purpose: The purpose of this standard operating procedure (SOP) is to describe the purpose, responsibility, and operation of the Interface Control Working Group (ICWG) and the functions required to support its operation. It is further intended to ensure that the numerous factors required to maintain program integrity are completed, to include assessment of the production Composite Health Care System (CHCS) II systems performance, capacity planning, patient safety, site network management, security, and configuration management within the Clinical Business Area (CBA).

Scope: The CHCS II Program Office has tasked the Configuration Management Contractor to support Configuration Management (CM) activities. The Configuration Management Contractor will develop, coordinate, and execute CM activities only as directed by CHCS II PO.

In this document, *interface* refers to the interfaces between systems that comprise CHCS II. Interfaces within single systems will be handled by their project CM organizations. Project CM organizations will escalate interface issues between business areas to the Technical Integration Working Group (TIWG) for resolution as required.

The ICWG is responsible for the technical analysis of changes, additions, and deletions to CHCS II interfaces for the deployed CHCS II. The ICWG meets on an as-needed basis or as called by the CHCS II PO. Recommendations reached by the ICWG on proposed changes, additions, or deletions to interfaces are forwarded to the Configuration Control Board (CCB) for implementation approval.

Updates to this SOP will be made with the approval of the CCB. This document is a working document during the life cycle of CHCS II.

List of References:

- MIL-STD-973 with Notices 1, 2, and 3, *Configuration Management*, 13 January 1995

- *CHCS II Configuration Management Plan*, dated TBD

- ICWG Charter, dated and signed 3 September 1997

- SOP CM-01, Version 2, *Engineering Change Proposal (ECP)*

- Composite Health Care System II/Clinical Business Area memo, Subject: CHCS II Interface Policy, undated

Participants and Responsibilities: It is the CHCS II PO's responsibility to manage the interfaces among the individual CHCS II projects/systems. The ICWG establishes and documents the interface policy for CHCS II projects. The Configuration Management Contractor coordinates and hosts the meeting in support of CHCS II PO. The program representatives are designated nonvoting members of the group and have certain responsibilities to CHCS II PO. The ICWG participant's roles and responsibilities are described further below.

Voting Members: The following participants are part of the CHCS II PO:

- Director of Systems Engineering and Integration – Serves as lead chairperson to the ICWG.

- Director of Logistics – Serves as cochairperson to the ICWG.

- Director of Software Integration and Coordination – Serves as cochairperson to the ICWG.

Non-Voting Members: The following are nonvoting members of the ICWG:

- The Configuration Management contractor – Serves as the ICWG host, prepares agenda, notifies participants, arranges teleconferences, prepares minutes, and records/reports action items from the meeting. The Configuration Management Contractor forwards proposed interface changes, recommended by the ICWG, to the CCB for approval. If the ICWG determines that the recommended interface changes can interface with other business areas within the MHSS, the recommendations are forwarded to the TIWG for consideration, as needed. The Configuration Management Contractor utilizes the templates in Appendix A for preparation of ICWG agendas and minutes.

- CHCS II Program representatives – Prepare interface baseline documentation changes, perform impact analyses (in the format shown in Appendix B) of proposed changes for ICWG review, and are technical POCs for proposed changes.

Procedures for Internal Interfaces: The ICWG will develop an interface control document (ICD) template for CHCS II. The template will describe the requirements for the documentation of CHCS II system interfaces. Upon completion, the template will be attached to this procedure.

The CHCS II interface control baseline consists of a set of ICDs. Each ICD is developed for each CHCS II system interface, as required. New ICDs and proposed changes to existing ICDs are technically evaluated by the ICWG and forwarded, with appropriate recommendations, to the CCB for final disposition. In this way, the CCB controls and maintains the interface control baseline.

Requested changes to the current interface control baseline require information described in Appendix B, "Interface Impact Analysis Statement." Appendix B data serves as the basis for discussion, approval, or disapproval of the documentation of a new interface or changes to the documentation of an existing interface. An existing interface is one that has been previously approved and forms a portion of the current interface control baseline.

The document that controls CHCS II configuration changes, the ECP, is also used to document and control changes to the interface control baseline. The ECP is developed by the Configuration Management Contractor with inputs from an ECP requestor including, but not limited to, the data supplied in accordance with Appendix B. The ECP is the vehicle that controls changes to interfaces that have been formally documented via the ICD and have been formally approved and baselined by the CCB. The ECP also controls the establishment of new interfaces, via the new ICD.

All ECPs are processed in accordance with the SOP CM-01, *Engineering Change Proposal (ECP)*.

Procedures for External System Interfaces: Interfaces to systems outside the CHCS II system require a higher level of approval and control.

If, in the course of reviewing interface ECPs, the ICWG determines that the request involves a change external to the CHCS II, it is forwarded to the TIWG for review and approval. The ICWG establishes an interim baseline for these interfaces under the direction of the TIWG, using its own processes and procedures. The TIWG has full access to resulting documentation to aid in current and future deliberations. The Configuration Management Contractor provides interim support to such requirements as required.

Overall ICWG Process:

1. The CM Contractor is informed of problems/issues with the interface, proposed changes to hardware/software, a new version of software affecting interfaces, or a new hardware model/platform that could affect the performance of the interfaces.

2. CHCS II PO directs the CM Contractor to initiate an ICWG meeting by phone call and/or electronic mail.

3. The CM Contractor develops the agenda, prepares invitations to the members, and prepares the

data/information for the ICWG. The development contractor(s) submits, to the CM Contractor, requested changes to the interfaces and the impact analysis on CHCS II systems (see Appendix B) 3 working days prior to the meeting for inclusion in the working packet provided to the ICWG members.

4. The CM Contractor hosts the ICWG meeting and documents the minutes and action items. The chairperson (CHCS II PO), the CM Contractor, and members of the ICWG review the requested changes, or additions to the interface control document and recommend to the CCB, approval, disapproval, or place the action on hold pending additional information.

5. The CM Contractor prepares the minutes of the ICWG technical meeting and forwards them to the CCB.

6. If the interface is between business areas, the CM Contractor forwards the interface change to the TIWG for action, as required.

7. Upon approval by the CCB, the CM Contractor performs updates to the approved interface control baseline and distributes ICD changes.

8. The CM Contractor maintains updated ICDs within the Configuration Management library and reports the status of each to the CHCS II PO via Configuration Status Accounting (CSA) reports.

ICWG Agenda Template:

Date/Time:

Location:

Meeting Number:

Participants Name/Phone Numbers:

- Director of Systems Engineering and Integration
- Director of Logistics
- Director of Software Integration and Coordination
- Configuration Management Contractor SysAM Coordinator
- Configuration Management Contractor Engineer
- Army MILDEP Representative
- Navy MILDEP Representative
- Air Force MILDEP Representative

Topic 1: Open Action Items
Topic 2: Hardware ECPs

    -- ECP Num., Rev Num, Title of Change

Topic 3: Software ECPs

    -- ECP Num., Rev Num, Title of Change

Topic 4: Open Discussion
Topic 5: Summary
Topic 6: New Action Items

Please direct questions concerning the ICWG to the _____.

ICWG Minutes Template:

Minutes from Interface Control Working Group Meeting

Date/Time:
Location:
Meeting Number:
Participants:
< Name/Phone >

1. Hardware ECP Status
2. Software ECP Status
3. Discussion Summary
4. Action Item Status

Please direct questions concerning the ICWB to the _____.

Required Information for Impact Analysis:

1.0 Introduction

1.1 Objective - Identify the purpose of the interface and the operational objectives of the interfaced product.

1.2 Scope - This section will identify all systems participating in the interface and briefly describe the technical, functional, and operational characteristics of the interface, as well as, the proposed deployment (single site, multiple sites, regional, executive agent (EA) etc).

1.3 Interface Definition - This section will, at a minimum, include the following:
- Description of the technical aspects of the product interface and how it will interact with CHCS
- Identification of the method of data that will be exchanged. (Health Level 7 (HL7) transaction, structure query language (SQL) query or through a special purpose interface).
- Identification of the data elements that will be affected and if these elements will be sent, received, or both.
- Identification of the impact to on-board CHCS data elements, tools as well as device handlers
- Identification of the physical communications interface used to transmit the data (transmission control protocol/Internet protocol (TCP/IP), Digital Equipment Corporation Network (DECNET) or any other).
- Description of the number of interface connections (single host, multiple hosts, such as an Inpatient Divided Work Center (IPDWC), etc.).

2.0 Applicable Documents - Provide a list of all documents, specifications, and publications used in the development of the statement.

3.0 Concept of Operations - This paragraph should provide a high-level narrative and graphic description of the purpose of the interface from a functional and an operational perspective. This section should include a brief description of any operational characteristics that will require action by CHCS (e.g., starting and stopping the interface, error recovery, etc.).

3.1 Assessment of Production CHCS system performance – This section will provide an assessment of how the interface may impact production CHCS system performance (number of transactions per unit time, volume of data sent/received, etc.) and should include a discussion of possible mitigation procedures for potential adverse system performance.

3.2 Capacity Planning – Identify what the capacity requirements will be for this interface and if and how these requirements may impact CHCS (e.g., use of CHCS disk space, communication bandwidth, etc.).

3.3 Patient Safety – Identify how patient safety is protected and how data integrity of patient records will be preserved (example: extensive testing of interface system, use of data validation procedures, etc.).

3.4 Site Network Management – Identify how the site network may be impacted and what steps are being taken to maintain the integrity of CHCS production operations.

3.5 Security – Identify the security standards to which each system is required to conform and the sensitivity of the data to be exchanged (e.g., command and control (C2) certified).

3.6 Configuration Management – Identify how the interface may impact CHCS configuration management. Provide information on how configuration management will be maintained in the CHCS environment.

4.0 Notes – This section can be used for any general information that aids in the understanding of the impact statement. At a minimum, abbreviations and acronyms should be listed.

5.0 Appendices – Appendices can be used to provide any supplemental materials deemed appropriate for the impact analysis statement which does not logically fit any other section. Information published here may facilitate document maintenance.

6.0 List of Figures - Figures should be used to provide explanatory and supplemental information deemed appropriate for the impact analysis statement. Information published here may facilitate document maintenance. Examples may include, but are not limited to, system diagrams, component block diagrams, data element diagrams, data/work flow diagrams, flow charts, etc.

7.0 List of Tables - Figures should be used to provide explanatory and supplemental information deemed appropriate for the impact analysis statement. Information published here may facilitate document maintenance. Examples may include, but are not limited to, tables of data elements, cross reference tables, contract line item number (CLIN) tables, configuration item tables, etc.

Glossary:

- CBA - Clinical Business Area
- CCB - Configuration Control Board
- CHCS - Composite Health Care System
- CLIN - Contract Line Item Number
- CM - Configuration Management
- CSA - Configuration Status Accounting
- DECNET - Digital Equipment Computer Network
- ECP - Engineering Change Proposal
- EST - Eastern Standard Time
- HL7 - Health Level 7
- HW - Hardware
- ICD - Interface Control Document
- ICWG - Interface Control Working Group
- IPDWC - Inpatient Divided Work Center
- MHSS - Military Health Services System
- MILDEP - Military Department
- PO - Program Office
- SOP - Standard Operating Procedure
- SQL - Structured Query Language
- SysAM - System Assessment Meeting
- TBD - To Be Determined
- TCP/IP - Transmission Control Protocol/Internet Protocol

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Configuration Management - Status Reporting   **CM Main**

Configuration Management Status accounting provides the detailed tracking of baseline configuration and change activity on a day-to-day, item-by-item basis. The Configuration Manager tracks all problem reports and changes from initiation to implementation. Configuration management is responsible for generation and distribution of the configuration status accounting reports.

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Configuration Management Reviews   CM Main

Quality Assurance (QA) or an external auditor may conduct configuration audits to ensure the project is complying with the Configuration Management (CM) Plan. QA may also conduct audits of the Contractor to ensure they are complying with their CM Plan. The results of the audit should be documented in a written report. Deficiencies should be tracked to closure through the action items.

Typical areas of review include:

- Version control of products and deliverables

- Change control information for each product/deliverable